

# **Comments on and proposed changes to the draft text for omnidirectional projection indication SEI message in PDAM3**

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(JCTVC-AA0031)

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- Three editorial comments are addressed on the draft text of omnidirectional projection indication SEI message in PDAM3
  - The range of roll\_center
  - Equations (D-60) and (D-67)
  - CenterLeftOffsetC, CenterTopOffsetC in Table D.22

## 1. roll\_center

It is written that the range of roll\_center shall be in -18000 and 18000. However, it seems that the coverage is overlapped when roll\_center has maximum or minimum value. The following is suggested definition of roll\_center.

- ✓ Current: **roll\_center** specifies the value of roll that corresponds to the center in the projection image, in increments of 0.01 degrees. The values of roll\_center shall be in the range of -18000 and 18000. When not present, the value of roll\_center should be inferred to be equal to 0.
- ✓ Suggested: **roll\_center** specifies the value of roll that corresponds to the center in the projection image, in increments of 0.01 degrees. The values of roll\_center shall be in the range of -18000 and 17999. When not present, the value of roll\_center should be inferred to be equal to 0.

## 2. Equations (D-60) and (D-67)

Following the equation (D-60),  $\theta_{\max}$  matches with  $j' = \text{croppedHeightY} - 0.5$  while  $\theta_{\min}$  matches with  $j' = 0$  (assuming that the roll angle  $\omega = 0$ ). When considering Figure D.14, however, the matching is described in the reversed direction, that is,  $\theta_{\max}$  matches with  $j' = 0$  while  $\theta_{\min}$  matches with  $j' = \text{croppedHeightY} - 0.5$ . To be aligned with the Figure D.14, the following correction is suggested.

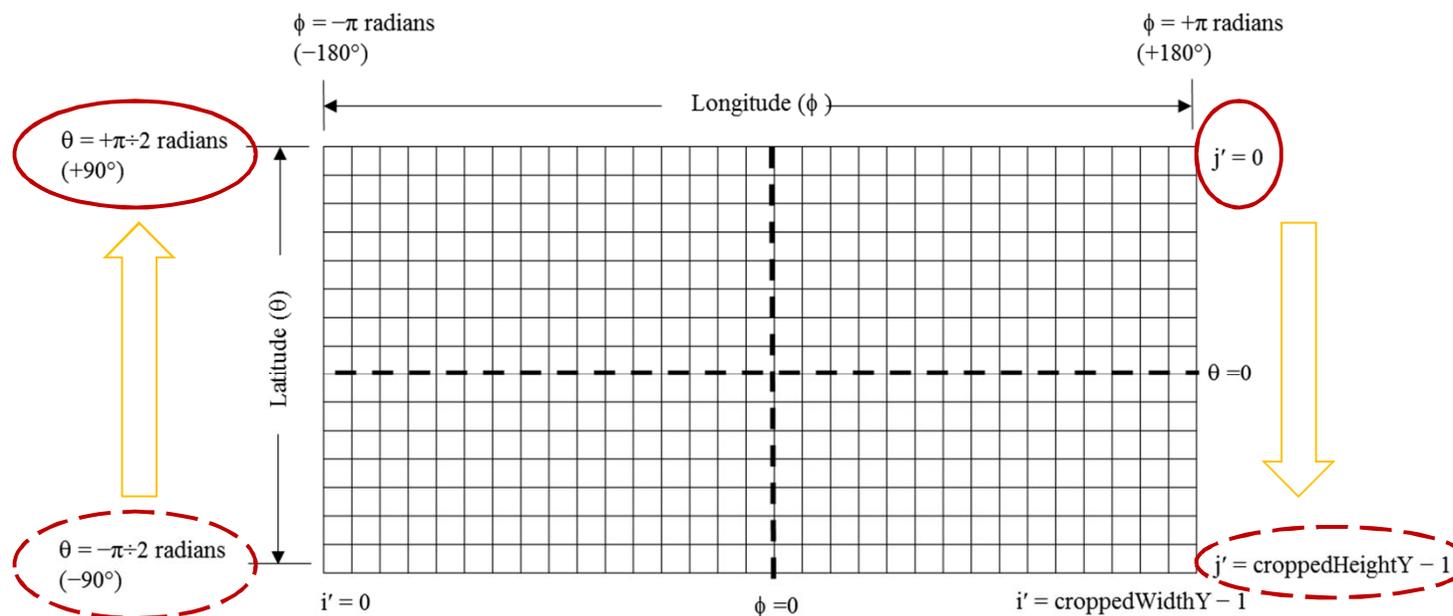


Figure D.14 Equirectangular mapping between cropped output picture luma samples and spherical coordinates

## 2. Equations (D-60) and (D-67)

Current equation in PDAM3

$$\phi_{\max} = ( \text{yaw\_center} + \text{yaw\_range} \div 2 ) * 0.01 * \pi \div 180 \quad (\text{D-56})$$

$$\theta_{\max} = ( \text{pitch\_center} + \text{pitch\_range} \div 2 ) * 0.01 * \pi \div 180 \quad (\text{D-58})$$

$$\beta = ( j' + 0.5 ) * ( \theta_{\min} - \theta_{\max} ) \div \text{croppedHeightY} - \theta_{\min} \quad (\text{D-60})$$

$$\theta = \text{Sin}( \omega ) * \alpha - \text{Cos}( \omega ) * \beta \quad (\text{D-62})$$

where

$$j' = j - \text{SubHeightC} * \text{conf\_win\_top\_offset} \quad (\text{D-64})$$

$$\omega = \text{roll\_center} * 0.01 * \pi \div 180 \quad (\text{D-65})$$

Assume that  $\omega = 0$  for simplicity, and then calculate two extreme cases.

1) when  $j' = 0$ ,

$\theta$  = is approximately  $\theta_{\min}$ .

Note that, the expected value is  $\theta_{\max}$

2) when  $j' = \text{croppedHeightY}-1$ ,

$\theta$  = is approximately  $\theta_{\max}$ .

Note that, the expected value is  $\theta_{\min}$

## 2. Equations (D-60) and (D-67)

### Suggested equation for PDAM3

$$\phi_{\max} = ( \text{yaw\_center} + \text{yaw\_range} \div 2 ) * 0.01 * \pi \div 180 \quad (\text{D-56})$$

$$\theta_{\max} = ( \text{pitch\_center} + \text{pitch\_range} \div 2 ) * 0.01 * \pi \div 180 \quad (\text{D-58})$$

$$\beta = ( j' + 0.5 ) * ( \theta_{\max} - \theta_{\min} ) \div \text{croppedHeightY} - \theta_{\max} \quad (\text{D-60})$$

$$\theta = \text{Sin}( \omega ) * \alpha - \text{Cos}( \omega ) * \beta \quad (\text{D-62})$$

where

$$j' = j - \text{SubHeightC} * \text{conf\_win\_top\_offset} \quad (\text{D-64})$$

$$\omega = \text{roll\_center} * 0.01 * \pi \div 180 \quad (\text{D-65})$$

With the correction, the equation will be matched with Figure D14

1) when  $j' = 0$ ,

$\theta$  = is approximately  $\theta_{\max}$

2) when  $j' = \text{croppedHeightY} - 1$ ,

$\theta$  = is approximately  $\theta_{\min}$

## 3. Table D.22

In the consideration of chroma sub-sampling, the pairs of left and top offsets are recommended according to the chroma sampling positions. As chroma samples are down-sampled by 2 pixel resolutions in the horizontal direction (for both 4:2:2 and 4:2:0) and in the vertical direction (only for 4:2:0), respectively, the offsets in the chroma sample grid is thought as half of the offset values in luma sampling grid. For example, the left and top offsets for chroma sampling type 2 with `chroma_format_idc = 1` are half of 0.5, i.e. 0.25. Assuming that this is valid, the following sets of `CenterLeftOffsetC` and `CenterTopOffsetC` are suggested for Table D.22.

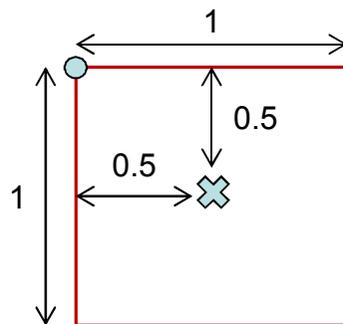
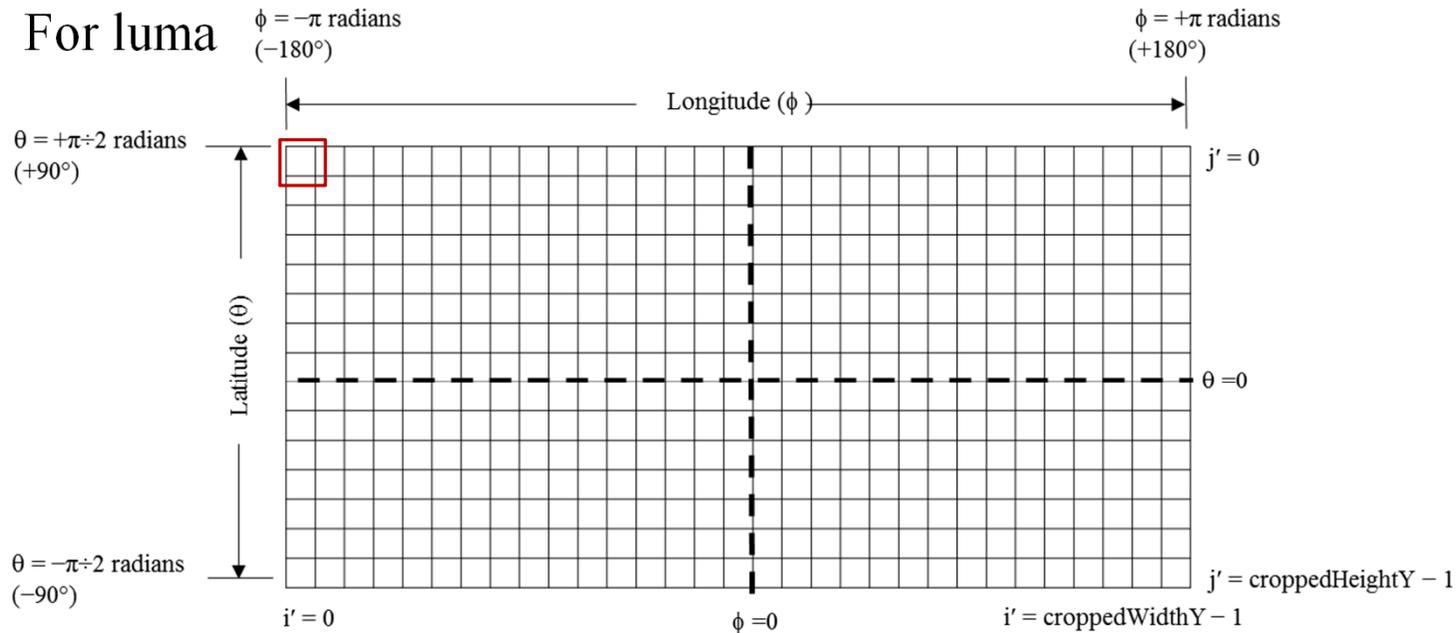
Luma offset in (D-59) and (D-60)

$$\alpha = (i' + 0.5) * (\phi_{\max} - \phi_{\min}) \div \text{croppedWidthY} + \phi_{\min}$$
$$\beta = (j' + 0.5) * (\theta_{\max} - \theta_{\min}) \div \text{croppedHeightY} - \theta_{\max}$$

Chroma offset in (D-66) and (D-67)

$$\alpha' = (i' + \text{CenterLeftOffsetC}) * (\phi_{\max} - \phi_{\min}) \div \text{croppedWidthC} + \phi_{\min}$$
$$\beta' = (j' + \text{CenterTopOffsetC}) * (\theta_{\max} - \theta_{\min}) \div \text{croppedHeightC} - \theta_{\max}$$

## 3. Table D.22



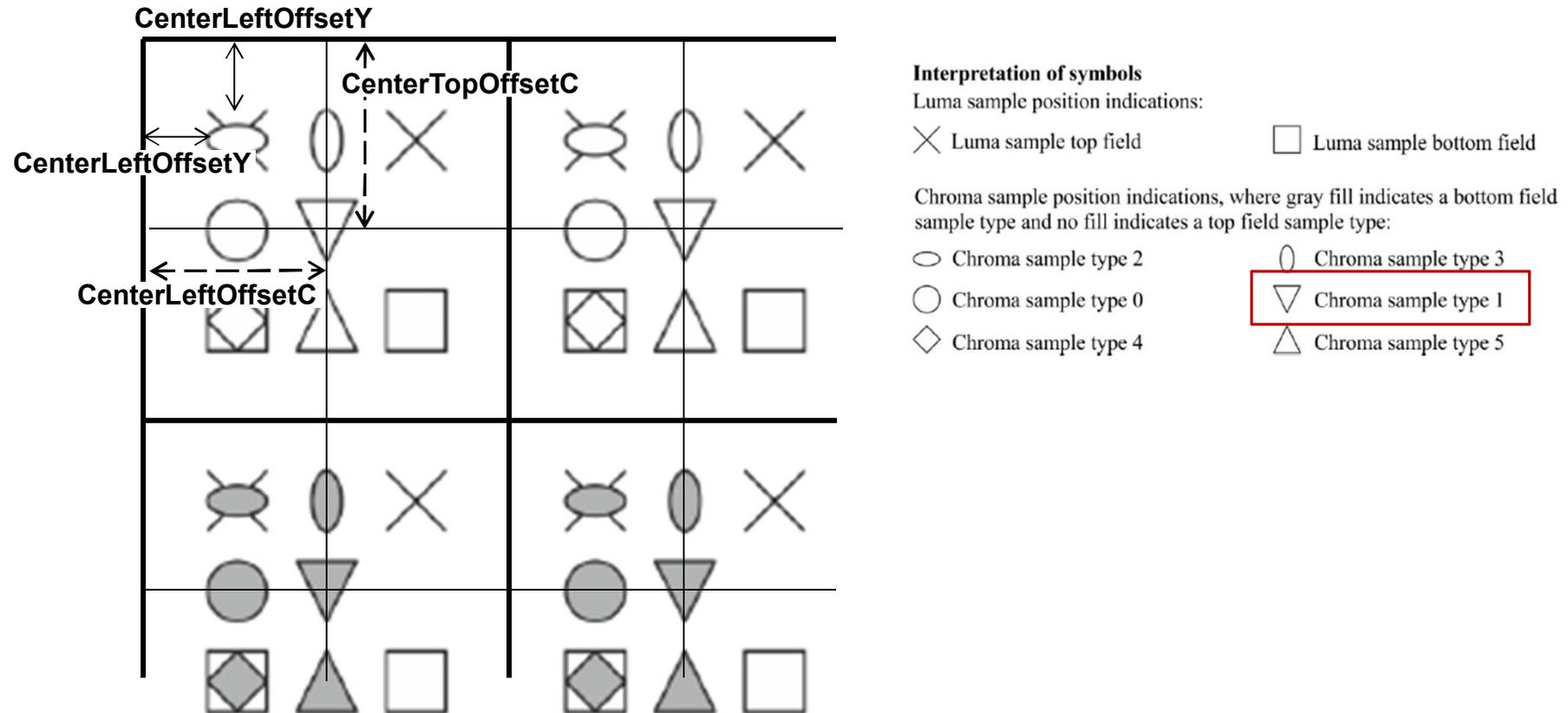
Pixel coordinate matches with center of each square.  
Spherical coordinate matches with vertex of squares.

With this understanding, the center of a pixel could be interpreted as (0.5, 0.5) shifted from top, left vertex.

Therefore, (CenterLeftOffsetY, CenterTopOffsetY) = (0.5, 0.5)

## 3. Table D.22

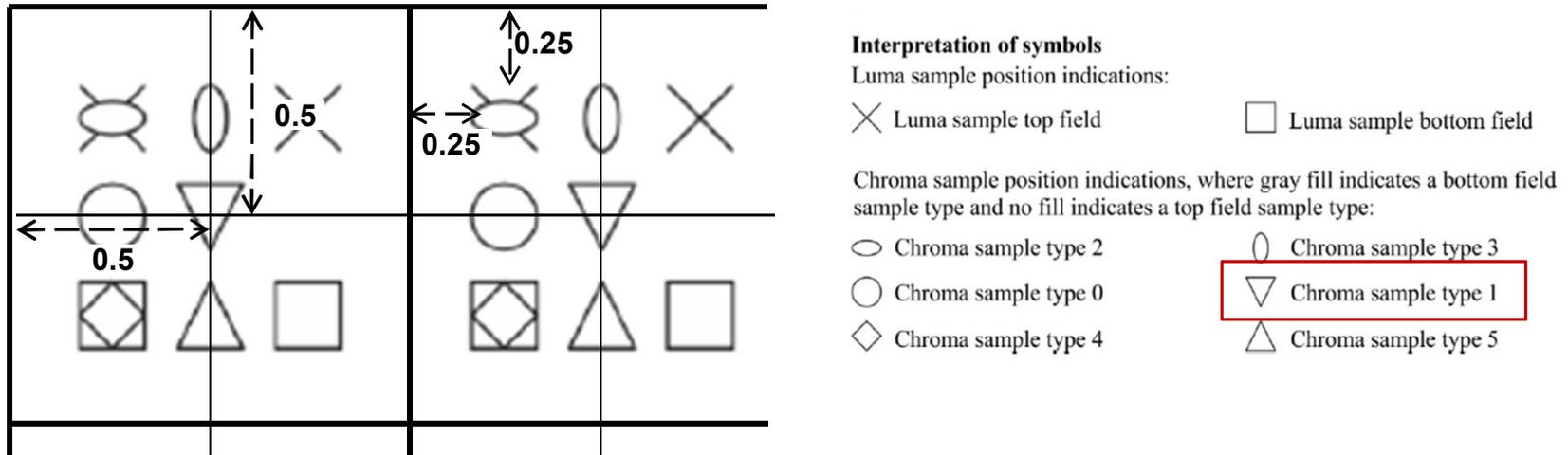
For chroma



Chroma sampling grid for 4:2:0 sub-sampling is half of luma sampling grid in both horizontal and vertical directions.

## 3. Table D.22

For chroma



**Table D.22 – Derivation of CenterLeftOffsetC and CenterTopOffsetC**

chroma_format_idc	ChromaLocType	CenterLeftOffsetC	CenterTopOffsetC
1 (4:2:0)	0	0.25	0.5
1 (4:2:0)	1	0.5	0.5
1 (4:2:0)	2	0.25	0.25
1 (4:2:0)	3	0.5	0.25
1 (4:2:0)	4	0.25	0.75
1 (4:2:0)	5	0.5	0.75
2 (4:2:2)	–	0.25	0.5
3 (4:4:4)	–	0.5	0.5

- Three comments on the draft text of omnidirectional projection indication SEI message in PDAM3 are addressed.
- The suggested texts are included in the appendix for JCTVC-AA0031.

**Thank you**